ASSESSMENT OF ENVIRONMENTAL IMPACTS AS PART OF AN INTEGRATIVE PLANNING PROCESS OF DEVELOPMENT

By

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Introduction

The human environment includes not just the physical world; it has social, economic, and political components as well. The discussion in this paper is based on this broad interpretation of the human environment which consists of the aggregate of all external conditions and influences (aesthetic, ecological, biological, cultural, social, economic, historical, etc.) that affect the life of a human.

Human activities towards development may change the environment the scope and nature of change is variable. However, the effects of such changes can either be beneficial or harmful to the environment but are usually a mixture of both. Thus, we have to be concerned with the optimization of the benefits and the reduction of the harmful effects. Environmental Impact prediction, assessment, evaluation and monitoring aim at satisfying this concern. The effect is directed toward preventing problems from occuring rather than remedying the damages caused or placating those who will be their victims. This being the objective, Environmental Impacts should become part of an integrative planning process of development particularly in a "developing" country like the Philippines so that we will not make the same mistakes as those which have been allowed to occur in "developed" countries.

Impacts Upon the Environment

A highly significant difference in the situation today as compared to 20, or even 10, years ago is that public opinion is moving toward strong support of environmental protection. The consequences of uncontrolled environmental contamination are cited routinely in the news media. They are now common topics of daily conversation. The present controversy between the project proponents on one hand and the people of the affected community on the other hand in connection with the proposed Copper Smelting Plant at San Juan, Batangas is an example. People are now asking questions: What sort

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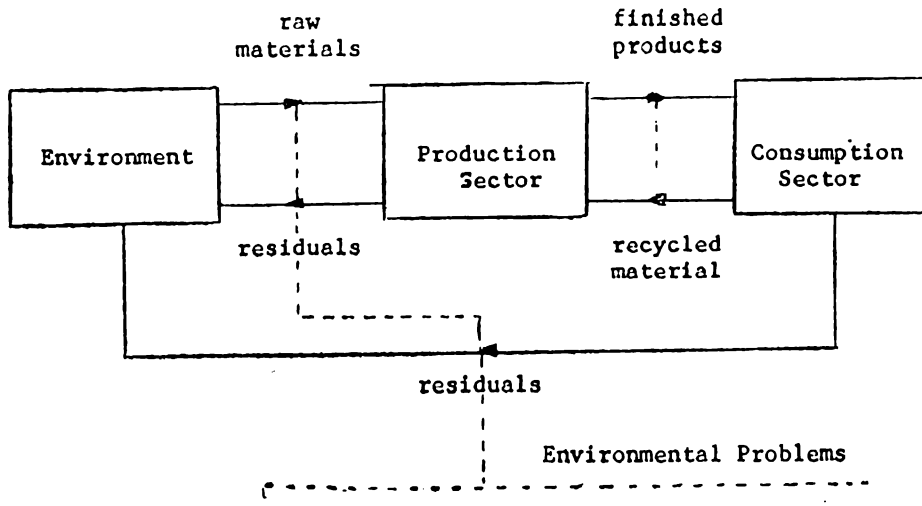
of a world are we making? For whom are we making it? Can we have essential goods and services without all this environmental degradation?

There is no doubt that population explosion and sweeping technological advances are urbanzing societies and creating unprecented environmental problems. These forces contribute to the increasing disharmony between man and nature especially in such areas as malnutrition, soil erosion, flooding, gross pollution and the attrition of the aesthetic qualities of parts of the environment which are valued in several cultures. Furthermore, the speed, magnitude and complexity of these forces should be our major concern because the increasing magnitude of resource processes is creating a set of environmental problems which transcend the boundaries of traditional disciplines.

The environmental problems created by more people using materials can be divided into (1) those with an environmental linkage and (2) those with a largely social linkage. Figure 1 shows the problems in each category and the mass flows between the sectors involved in the production of residuals.



those with an environmental linkage
* sewage
* sulfur dioxide fallout
* habitat requirements of migrating birds

those with a largely social linkage
* food supply and consequences of agricultural intensification residual pesticides
* effects of the contamination of the ocean by oil
* alteration of atmospheric processes by increased load of carbone dioxide and particulates

FIGURE I.

The above-illustrated interaction suggests that population increase could cause two major environmental problems namely, (1)

degradation of the environment as a result of the discharge of residuals which could exceed the environment's assimilative capacity and (2) the depletion of resource materials.

In summarizing the global water pollution situation in 1964, Hollis[1] discussed the thrust of public aspirations vs. hard-nosed realities. Four pertinent broad-conclusions were suggested:

1. The concept of minimal treatment is outmoded and must give way to a maximum treatment concept, with cost-benefit ratios computed on a drastically revised system of water and land uses and values.

2. Public opinion and public demand for pollution abatement is beginning to move ahead of professional actions and plans.

3. We, in the composite professional sense, have been too cautious, too conservative, often apologetic in our justifications when speaking resources to combat pollution, and too optimistic in reporting progress.

4. The day is approaching when standard practice of waste treatment will have been applied, and in some areas such treatment will be inadequate. The question: Is our research effort sufficient in magnitude and properly focused to establish remedial procedures geared to the problems of tomorrow?

As to the depletion of resource materials, what would be the environmental impact when water needs rise dramatically and the local supply is exhausted? What would be the environmental impact if the provision of minerals and fossil fuels to an expanding population is inadequate? What would be the effect of these changes on food production? With the power of modern technology, the industrialized nations might develop national and international ecosystems that are not technically, economically, and politically controllable. Is it possible that technological specialization in certain areas should be bounded for reasons of controllability as well as mass-energy compatibility with the environment? How would these problems affect the social and political stability of the people?

The link-chain interrelationship of these changes requires the consideration of all the conditions of the environment that will be affected in order to find solutions to the changing human needs and values solutions which will balance environmental quality objectives against redefined values.

[1] Hollis, M.D. "The Water Polution Situation — Aspirations and Realities." Journal of Water Pollution Control Federation, 37 (1965).

Perhaps at no time in history has there been such difficulty in forecasting environmental, social and economic changes. Rapid changes in the physical and technical structure of the material processing system may impose excessive stresses on society in a variety of social, political, and economic forms. Circumstances of unprecedented magnitude are confronting nations and international relations such as access to raw materials and energy sources, inflation, economic and social disparities, availability of food, demographic pressures and many others. Discussions on the "environment" must therefore be against this complex background-the era of change, population explosion and technological advances.

Components of Impact Assessment

Assessment of environmental impacts is the process through which all significant changes brought about by an action are analyzed and evaluated. There are two components in this definition which must be emphasized: impact analysis and impact evaluations. While the former is the principal concern of planners, the latter is the principal concern of the decision makers.

Impact analysis is that component of the assessment process in which environmental, social and economic changes are predicted and described in quantitative and/or qualitative terms using standard techniques and/or professional judgments.

Impact evaluation, on the other hand, is that component of the assessment process through which alternative actions are compared for the purpose of establishing preferences. The establishment of such preferences takes into consideration (1) the values on various impacts as placed by individuals or groups directly affected by the proposed action and (2) the various objectives and criteria of national and regional significance (e.g., national economic efficiency considerations).

Long-range planning efforts for industrial and technological developments must take into consideration the realtive merits of alternative structures against the social and cultural values of the society it is to service. This strategy requires, among other things, application of the following principles:

1. Focus is on the design, management, and planning of systems as well as part of systems. Piecemeal and unintegrated concentration on parts of systems is avoided when possible.

2. All significant interactions are considered so that they will be complementary or at least so that deleterious consequences will be minimized.

3. All relevant objectives and constraints are considered, not just those directly affected by the system being engineered.

4. Systematic and, whenever possible, quantitative methods of analysis are used. Models or analogs are used, when economically available, to make predictions and evaluate consequences by explicit means.

Multidisciplines

Expertise in all fields of natural, human and technical sciences will be required to develop a number of valid alternatives for the decision maker to choose. Environmental quality control, for example, transcends the competencies and capacities of any one profession or of any one department. Accordingly, it is necessary to have a multidisciplinary approach in finding solutions to these problems and to blend the expertise of science, engineering, medicine, law, education, economics, architecture and administration.

Let me illustrate this multidisciplinary nature of environmental problems by the following two simple examples.

Example 1: Proposed flood control reservoir. Among other things, there are three projections that might have to be made as part of an impact analysis namely, (1) a water quality expert's forecasts of changes in river temperature; (2) a landscape architect's inventories of visual setting with and without the reservoir; and (3) an economist's estimates of project-induced shifts in floodplain land values. Thus, a water quality specialist might elaborate on how the temperature changes relate to water quality standard sand alternative uses of the river's flow. A landscape architect might characterize the visual changes in terms of various aesthetic criteria. An economist might elaborate on which groups of people would experience economic gains or losses as a consequence of the shift in land values.

Example 2: Consequences of agricultural intensification.— The intensification of agriculture in various forms has social and environmental impacts, Briefly, the following issues merit assessment:

(a) Mechanized agriculture does not only result in an increase in yield per hectare of agricul-

tural land and an increase in the solar energy conversion of the photosynthetic processes but also on a disproportionate increase in the volume of chemicals that must be processed and broken down by the environment.

(b) The application of these chemicals may exceed the capacity of the environment to dilute and to assimilate the pesticide and fertilizer roundoff and thus, impose reductions in the real outputs of the natural environment and its aesthetic value.

(c) The adoption of mechanized farming through the use of larger mecahnics has relieved back-breaking labor operations and improved the human labor efficiency of man in carrying out the cultural practices. However, it may eventually lead to the elimination of the "family farm" and the relatively small villages where their wastes are reasonably within the assimilative capacity of the landscape components.

(d) Increased labor efficiency through the use of increasing large machines also leads to increased specialization and spatial concentration of operations such as poultry, beef, and milk production and virtually eliminates crop rotation and diversification which, to a certain extent, can be used to further reduce both the fertilizer and the pesticide requirements. Further, the above-mentioned specialized operations may aggravate the material recycling and material distribution problems. For example, for each pound of beef consumed by the city dweller, ten pounds of material must be absorbed by the natural environment. The question: What should be the best tradeoff?

(e) These developmental activities may load and degrade the environment to the extent that the people will be deprive of what used to be part of their recreation activities such as camping, hunting, hiking and other outdoor activities. Again, what are the tradeoffs? How are they to be evaluated? To what ex-

tent is the migration to the city attributed to social factors in contrast to economic conditions generated by economic policy and technological development?

Indeed, many environmental and social impacts occur in form that are very difficult to identify and evaluate. Much has to be done to obtain a secure information based from which scientific criteria on cause-effect relationships can be derived. However, an Environmental Impact Assessment will provide a test to our capacity of managing human activities in the face of uncertainty.

Checklist of Characteristics and Conditions of the Environment to be considered in an Environment Impact Statement[1]

1. Earth
   (a) Land form
   (b) Reserves of raw materials
   (c) Reserves of minerals
   (d) Productive quality of soils
   (e) Structural stability of soils (slides, slumps)
   (f) Stress-strain (earthquakes)
   (g) Compaction and settling
   (h) Erosion of soils
   (i) Salinity of soils
   (j) Deposition on land (sedimentation)
   (k) Dereliction of land
   (l) Flooding
   (m) Wetlands
   (n) Fields of force
   (o) Radiation background
   (p) Sorption (ion exchange)
2. Water
   (a) Quality and quantity of surface water
   (b) Quality and quantity of underground water
   (c) Quality of estuarine and ocean water
   (d) Siltation of waterways
   (e) Quality and quantity of drinking water
   (f) Butrophication
3. Atmosphere
   (a) Air quality
   (b) Air temperature

[1] Journal of Engineering Education in Southeast Asia, Volume 6, April, 1976.

(c) Air movements
(d) Climate
(e) Rainfall, snow and ice, frost
(f) Fog
(g) Low cloud

4. Vegetation
   (a) Trees
   (b) Shrubs
   (c) Grasses and herbs
   (d) Microflora
   (e) Aquatic plants
   (f) Crops
   (g) Orchards, plantations and vineyards
   (h) Forests
   (i) Unique, rare or endangered species
   (j) Noxious plants

5. Fauna
   (a) Birds
   (b) Native land animals including reptiles
   (c) Introduced animals including livestock
   (d) Fish and shellfish
   (e) Benthic organisms
   (f) Insects
   (g) Microfauna
   (h) Unique, rare or endangered species

6. Land use
   (a) For grazing
   (b) For forestry (native or exotic stands)
   (c) For agriculture
   (d) For commercial fishing/oyster beds
   (e) For residential development
   (f) For commercial development
   (g) For industrial development
   (h) For mining, quarrying and extraction
   (i) For waste disposal
   (j) For passive recreation
   (k) For active recreation
   (l) As a resort area
   (m) National Park or wilderness area
   (n) Reserves for aboriginal people
   (o) Reserves for flora or fauna
   (p) Port development

(q) Defence establishments
(r) Special purposes
(s) Other

7. Recreation
   (a) Hunting
   (b) Fishing
   (c) Boating
   (d) Swimming
   (e) Sporting activities
   (f) Camping
   (g) Hiking
   (h) Picnicking
   (i) Other

8. Aesthetics and Human Interest
   (a) Scenic views and vistas
   (b) Natural bushland
   (c) Open space
   (d) Landscape design
   (e) Unique or rare physical features
   (f) Parks and reserves
   (g) Playing fields
   (h) Monuments
   (i) Historical buildings, sites or objects; archaeological sites and objects
   (j) Visual character; presence of misfits
   (k) Foreshores
   (l) Other

9. Sociological
   (a) Land tenure, ownership and tenancies
   (b) Access and mobility
   (c) Population density and age grouping
   (d) Employment
   (e) Cultural patterns and life styles
   (f) Personal comfort (incl. noise effects)
   (g) Human health
   (h) Human safety
   (i) Noise

10. Ecological Relationships
   (a) Ecosystem structure and function including the importance of barriers to or corridors for the migration of plants and animals

(b) Nutrient cycling
(c) Disease including insect vectors and introduced hosts
(d) Energy flow and food chains
(e) Synergistic effects

11. Man-made Facilities
    (a) Buildings and structures
    (b) Transportation system (movement, access)
    (c) Utilities distribution systems
    (d) Communications systems
    (e) Processing plants
    (f) Barriers
    (g) Corridors
    (h) Education and research facilities

If environmental impacts have to be taken into account, the planners and decision-makers are indeed faced with the major problem of identifying and analyzing all the impacts on the environment that will occur over time. It is recognized that this will involve a wide array of effects—some that are not knowable at present, some that are not quantifiable, some that are not numerable. Many will involve value judgments which, even if identified, will vary over time and place and from the point of view of the special interests concerned.

An Environmental Impact Statement (EIS) should at least contain the following:

1. minimum scientific or technically valid criteria
2. the identification of natural and human activity functions which will be affected by a project.
3. the extent and degree of significance of the impacts
4. the alternatives to be considered
5. an evaluation of its replicability and of its suitability for integration in basic project planning in the future
6. specific procedures for on going monitoring and compliance with the possible restrictions involved in carrying out the project.

EIA As Part of the Development Project Appraisal

Since the Environmental Impact Assessment (EIA) has the same objective as that of development, presumably the improvement of human welfare, it must be integrated in the planning process of development.

The tragedy of the antipollution effort in the past, for example, is that policies and goals have been at least a decade behind the tempo change. Hence, over the years the situation has worsen and now, in some areas, approaches crisis proportion.

It is needless to say that the environmental problems that we are trying to correct today would not have reached the present situation had there been an Environmental Impact Assessment prior to the project implementation. Take the zoning of industrial plants in the Metropolitan Manila Area as an illustrative example. A study of the locations of the various industries in the area shows no zoning plans as to industrial categories. The only noticeable trend is that wastewater dischargers are located near rivers and esteros. Yet, the proper zoning regulations had it been part of the process of development would have made our water quality control programs and strategies simpler and less expensive.

If the Environmental Impact Assessment are carried out after a project has been planned and by its own proponent, this puts the promoter in an unfair, defensive position as regards the burden of proof. Likewise, if the project is of government origin, the EIA will clearly tend to modify the normal decision making process, and no department will take kindly to its decisions being reviewed by others. Thus, an integrative planning process including EIAs part of the development project appraisal may be the only global problem-solving approach. However, we have to develop the capacity and willingness of the private and public planning systems to review problems from the higher level necessary to integrate economic, social, technical, political, administrative and environmental aspects.

Problem Areas in the Preparation of an EIS

Being a new tool and instrumentality in seeing to it that development is in conformity with the national policy of maintaining environmental quality, we should expect some inevitable problems in the preparation of an EIS.

1. Access to relevant information is difficult due to the compartmentalization of data
2. Information is inadequate in substance and in form
3. Indirect impacts are usually neglected if not omitted. There is usually very little consideration given to secondary or higher other impacts as new causes for "unforseen" stresses on the environment.

4. The relationship between the proposed project and other planned developments within the region is seldom established.

5. The EIS reflects the bias of the proponent of the project in that it is assumed if the project will occur, environmental constraints are being identified strongly as a hindrance to progress, development, freedom or whatever.

Conclusion

The tradeoffs society is willing to make between material returns and the aesthetic and recreational features of the ecosystem must be reflected in our development plans. We must have the capability to design and implement comprehensive economic, political, and, and other social instruments of control if we desire to manage technological and economic development to be ecologically compatible with the environment and socially desirable. As previously mentioned, expertise in all fields of natural, human and technical sciences will be required to develop a number of valid alternatives for satisfying human needs.

The role played by social scientists in this process is very large. While some of the effects of pollution can be quantified within the context of the present economy, there are others which are not measurable such that we cannot evaluate its full social cost. For example, what is the social cost of the inconvenience, discomfort and frustrations associated with poor health, an abrasive environment and reduced life expectancy brought about by pollution? Can we possibly develop an operational way for measuring the social value of clean air or clean water or the social cost of pollution?

Indeed, it is essential that effective communication takes place between planners, decision makers and affected publics if we really want to develop plans for the improvement of human welfare. There must be a continuing reassessment of our approaches and techniques and the levels of our commitments since the influences that contribute to environmental degradation are themselves changing and accelerating. It must be recognized that planning is a means to an end, not an end in itself.

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